

CHAPTER 3: ALTERNATIVES ANALYSIS: COST AND RIDERSHIP

Each of the four alignment and technology options is technically feasible to build and operate. However, different alignments have different effects on ridership, and on right-of-way acquisition, capital and operating costs. In addition, each option poses various challenges to community acceptance, some more serious than others. This chapter analyzes each option by key segment according to:

- New transit riders
- Capital cost, including right-of-way acquisition
- Operating cost

Chapter 4 uses the data in this section to analyze the alternatives according to BART's System Expansion Criteria, including critical factors such as cost per new rider. More detail on these technical analyses can be found in the Technical Supplements.

Ridership Methodology

Methodology

Fehr & Peers created a travel demand model to estimate ridership starting with data and mode choice forecasting models available from the Alameda County Congestion Management Agency, the Contra Costa Transportation Authority and the San Joaquin County Council of Governments. To help estimate ridership, the Phase 1 study relied upon a “stated preference survey” that asked existing residents and employees how they would respond to various transit alternatives. The Phase 2 study differs in that it uses actual empirical evidence of ridership patterns at BART and Caltrain stations throughout the Bay Area, noting the relationship between ridership and the following factors:

- Population and employment within both half mile and quarter mile radii of the stations
- Feeder bus service level
- Number of parking spaces
- Train frequency

- Train technology (BART versus Caltrain)
- System speed
- Station spacing

This different methodology eliminates the possibility that some commuters will say they will do one thing (take transit) while actually doing another (drive). More importantly, it allows for commuters to make locational decisions based upon the presence of transit. That is, commuters with jobs near BART have an increased likelihood of choosing housing near a BART station, just as people who live near BART are more likely to look for jobs within an easy BART commute.

Finally, the Phase 2 model differs in that it allows total travel demand over Altamont Pass to be “unconstrained,” unlike the Alameda County model used by the Phase 1 study. By creating new transit services over the pass, all four alternatives allow for the possibility of increased people traveling in the corridor, even if the number of cars is constrained by the available capacity on I-580.

Like Phase 1, the model assumes a variety of completed regional transportation projects by 2020, including an infill BART station at West Dublin/Pleasanton, and BART connections to San Jose and the Oakland and San Francisco airports.

Land Use Methodology

Baseline Scenario

In order to provide solid land use basis for the ridership analysis, the study team collected specific plans and general plans from each city in the study area, and conducted stakeholder interviews with planning officials. The ridership model uses detailed land use inputs for each potential station site, counting the total residents and total jobs within quarter-, half- and one-mile rings around each station. The Baseline projections are for 2020, with Traffic Analysis Zone (TAZ) data from ABAG’s Projections 2020 allocated into the distance-based rings according to actual land use plans in each city. Adjustments were made to the Livermore projections based upon their updated General Plan and the decision to restrict North Livermore from potential development.

TOD Scenario

In order to estimate the potential effect of Transit Oriented Development (TOD), both land use and preliminary economic feasibility analyses were conducted. The following is a summary of the TOD assumptions used in the model:

- Walnut Creek's TOD figures were drawn from the preliminary results of the "Shaping Our Future" process. City staff interpret the results of that process to produce an additional 1,500 residents, 1,114 office jobs and 270 retail jobs by 2020.
- San Ramon's Crow Canyon Specific Plan and Northwest Specific Plan assume a significant amount of transit supportive housing near the three proposed stations in Bishop Ranch. In addition, we assume that the presence of transit and Transportation Demand Management programs would allow Bishop Ranch to increase its jobs and residents by 25% without an increase in auto traffic.
- Dublin is mostly already planned to be built out at transit supportive density by 2020, although its land use patterns will remain primarily auto-oriented. We assume modest improvements to Dublin's land use patterns, as well as some new residential development at Camp Parks. If transit is routed along Camp Parks, it becomes an extremely attractive location for dense, mixed-use, transit oriented infill development.
- Pleasanton's restrictive growth limitations pose a challenge for TOD, but two infill sites were included in the analysis. Hacienda Business Park is in the beginning stage of an infill plan that might include a 25% increase in jobs and residences without generating additional traffic. In addition, the city is beginning a specific plan process for a former gravel processing site in East Pleasanton. Both locations offer significant ridership potential.
- Livermore has recently completed a draft update to its General Plan and Downtown Plan. These documents allow for modest increases in density at five of the six potential station areas.
- Tracy is planning substantial development by 2020, and some of the developments proposed around the existing ACE station and downtown may be more transit oriented than typical Tracy projects.

For more detail on the land use allocation process, see in the Technical Supplements.

Ridership Results

Ridership for all four alternatives is remarkable in its similarity. Examining the sources of ridership in detail, the following key conclusions can be drawn.

General Conclusions:

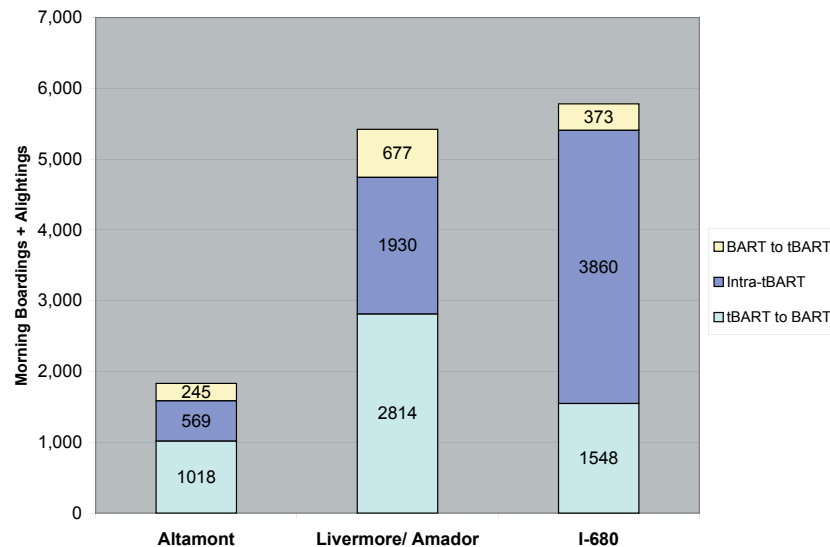
- **Direct service to Tracy is productive.** Because of the travel time advantages offered by all four alternatives, most commuters who work anywhere near a transit station will choose transit over driving.
- **Serving the population centers of Livermore, Pleasanton and Dublin is highly productive.** All three rail options generate more riders in the Tri-Valley than the Phase 1 Base Case, due not just to the larger service area, but also to the more productive alignment. Option 1's alignment through the employment-rich Hacienda area is also productive – and more so than Option 2's route along I-580. Option 1 carries nearly twice as many, while Option 2 and 3 carry 50% more than the Phase 1 project.
- **Ridership increases as the number of stations increase.** Option 1's ten DMU stations in the Livermore Valley produce significantly higher ridership than Option 4's two BART stations. This is largely due to the significant number of intra-Tri-Valley trips that a many-station service effectively captures. Options 2 and 3 show similar ridership despite different technologies. While travel time increases with additional stations, it remains attractive to long distance travellers transferring to BART.
- **Bishop Ranch and downtown Walnut Creek** produce some of the highest ridership in the study area.
- **Most importantly, the three DMU options are highly successful in serving all four key travel demand markets** identified in Chapter 1. The chart on the next page shows how total tBART ridership for the DMU options breaks down according to trip type.
 - Successful in capturing intra-Tri-Valley trips: 49% of tBART trips start and end in the Tri-Valley
 - Successful in capturing "reverse commute" trips to Tri-Valley job centers: 10% of AM tBART trips are *from* BART to tBART.
 - Less than half of those who board tBART in the Tri-Valley in the morning transfer to BART.
 - Over 40% of Altamont Commuters stay in Tri-Valley.

Conclusions by Option:

- **Option 1** combines three key elements to produce the highest ridership west of the Altamont and the highest ridership overall:
 - o Its frequent stop spacing attracts a significant number of

Figure 3-1

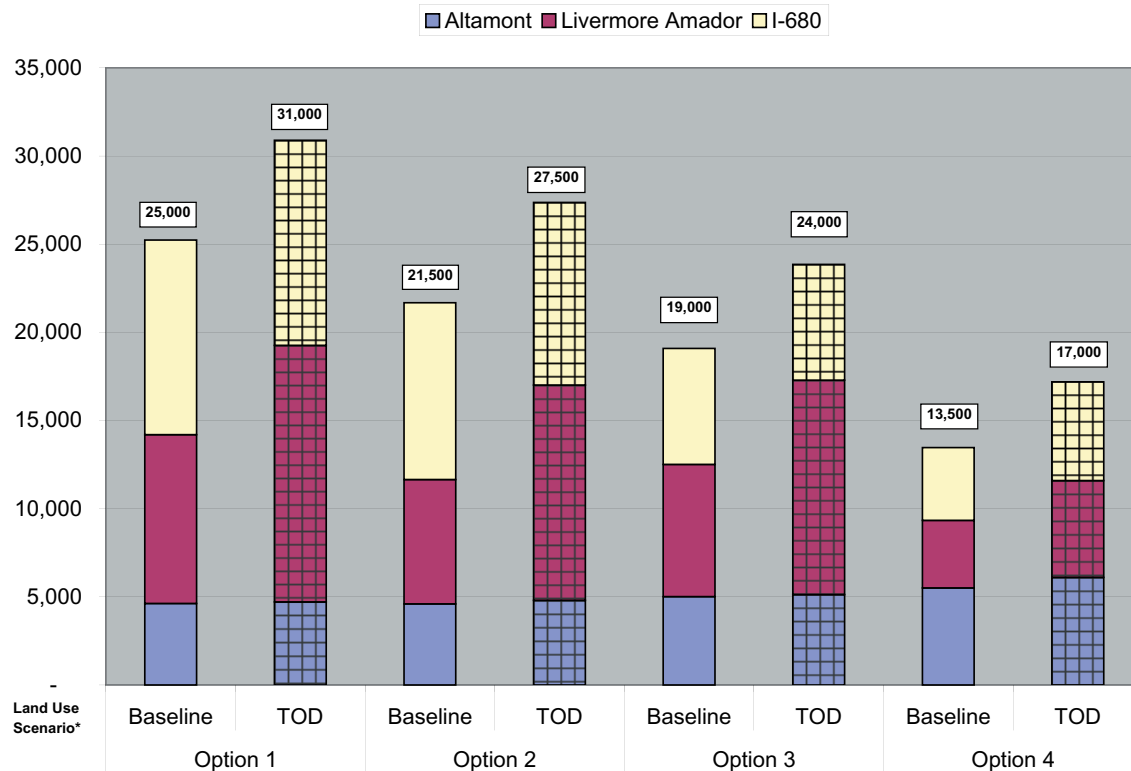
Ridership Analysis: Option 1 – AM Boardings and Transfers



intra-Tri-Valley trips, the largest potential trip market

- o It directly serves all of the most important destinations in the study area: downtown Livermore, Hacienda Business Park, Bishop Ranch and all of downtown Walnut Creek.
- o Its alignment on the Iron Horse Trail corridor allows for important speed and efficiency advantages, while also serving residences in San Ramon and Dublin.
- o It has good service over the Altamont and picks up commuters heading to the Tri-Valley or connections with BART.
- **Option 2's** ridership is diminished due to its circuitous routing through the East Pleasanton gravel pits and the Dougherty Valley. Due to the extra travel time and the auto oriented nature of the Dougherty Valley, there is a 12% drop compared to Option 1. However, these routes are still competitive with traffic congestion on I-580 and I-680.
- **Option 3** provides the highest ridership in Tracy, but it suffers west of the Altamont due almost entirely to its

Figure 3-2
New Daily Riders



* "Baseline" = Association of Bay Area Governments' 2020 *Projections*, minus North Livermore. "TOD" = ABAG's 2020 *Projections*, plus extra infill at key destinations such as Bishop Ranch, Greenville, and Hacienda.

single station in downtown Walnut Creek, as opposed to the four stations offered in options 1 and 2. Option 3's total ridership is about 75% of Option 1's.

- **Option 4's** BRT connection over the Altamont produces almost exactly the same ridership as the other three alternatives. Its two-station BART extension to Greenville, however, is significantly less productive than the other options' many-station service through the population centers of Livermore and Pleasanton. Its multiple transfers and lack of service to Dublin also result in less ridership in the I-680 corridor. Overall, Option 4 produces about 30% fewer riders than Option 1.
- **Increased TOD** in each option simply enhances the differences among the options, increasing ridership in each segment. Due to restrictions against significant new development in most study area cities, the realistic TOD ridership increment is relatively small. The highest TOD potential is in Bishop Ranch, Hacienda, East Pleasanton and Tracy.

Figure 3-3
Option 1 Daily Ridership by Station (Baseline)

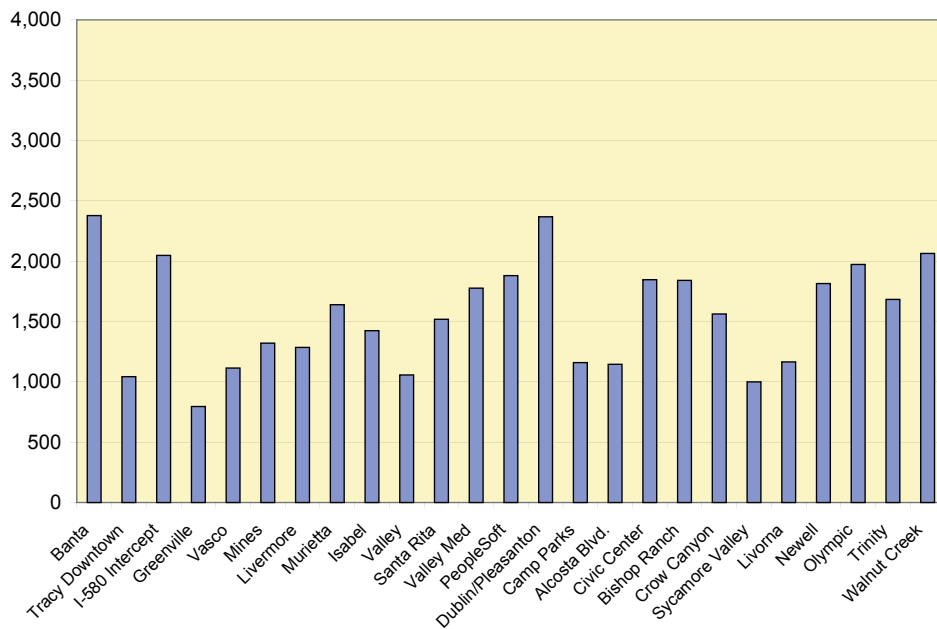


Figure 3-4
Option 2 Daily Ridership by Station (Baseline)

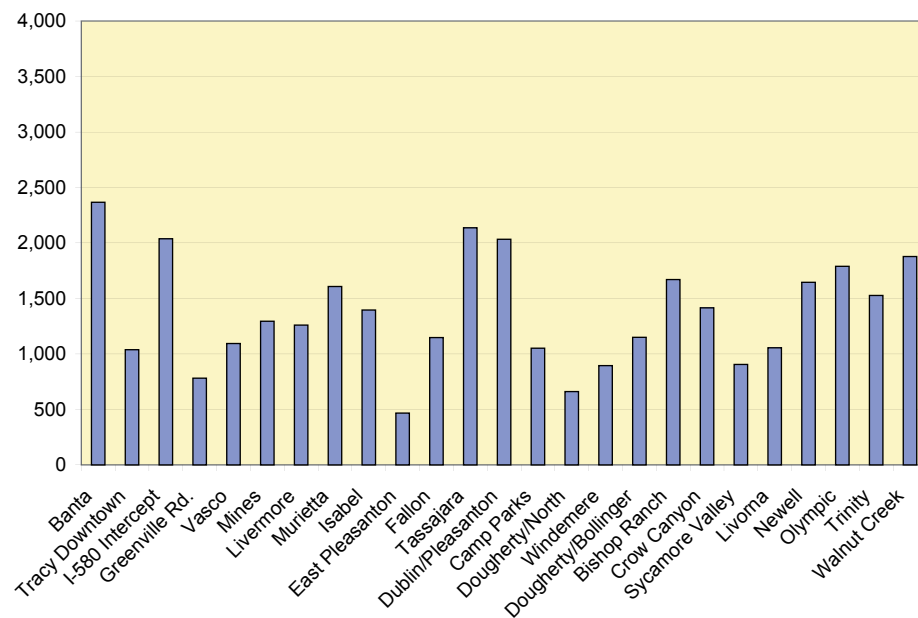


Figure 3-5
Option 3 Daily Ridership by Station (Baseline)

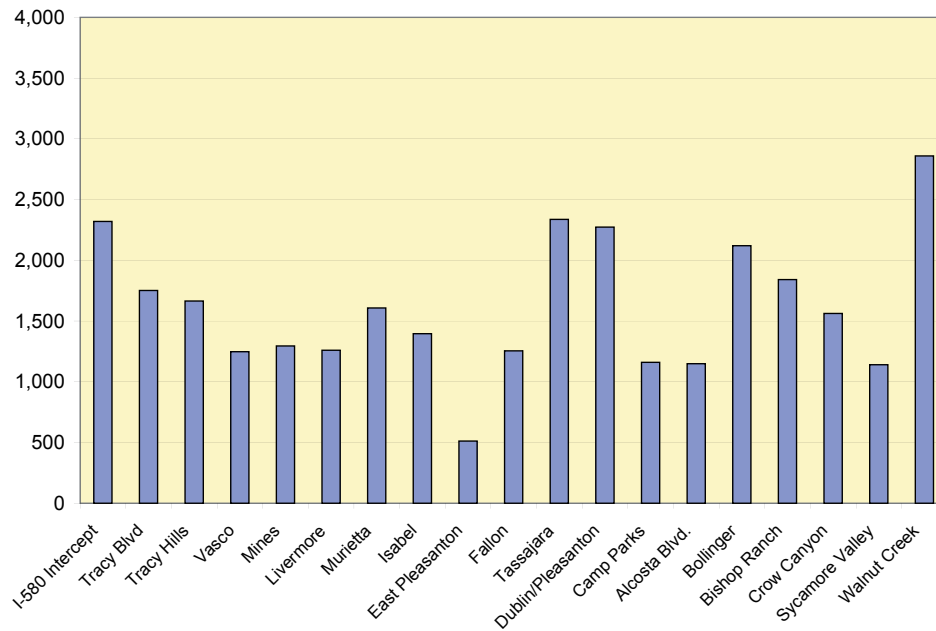
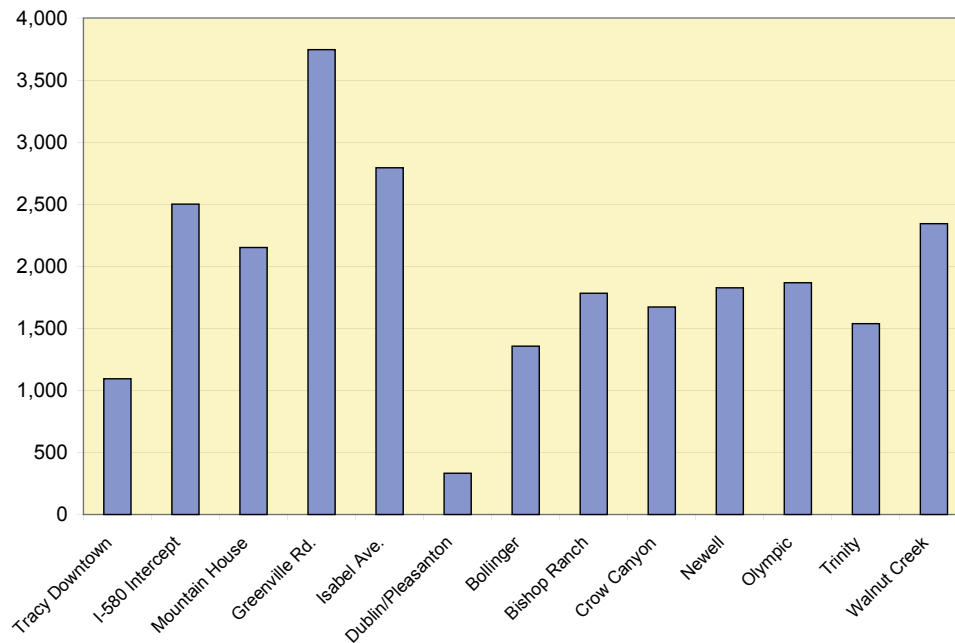


Figure 3-6
Option 4 Daily Ridership by Station (Baseline)



Costs

Costs are summarized here for capital (construction) and operating costs.

Capital Costs

Capital costs are divided into five categories:

- Construction of structures, tracks and systems
- Vehicle acquisition
- Construction of stations and parking
- Land acquisition for right-of-way, station areas and parking
- Implementation and contingency reserves

Additional detail can be found in the Technical Appendices.

Some of the major variable construction costs include tunnels, bridges and other structures, with the proposed tunnels in Options 1 and 2 adding significantly to their overall cost.

Right-of-way acquisition and parking are the other major variable costs, representing up to a third of total project costs. The initial ridership methodology assumed that parking was “unconstrained” except at stations that were largely built-out, such as in Walnut Creek and Pleasanton. Once initial ridership projections were made for each station, parking demand was estimated using figures for comparable BART and Caltrain stations, under the assumption that all parking would be free. For stations with parking, enough spaces are provided to meet the maximum ridership demand. In actuality, it will not be cost effective to provide so much parking and some ridership demand will not be met. The appropriate amount of parking will be estimated in the next stage of the planning process.

The costs for right-of-way acquisition provide an “order-of-magnitude” estimate, given that much of the right-of-way must be acquired from UP through purchase or joint use agreement. Other sections are already owned by public agencies, but it is still assumed that BART must acquire these rights-of-way at full market cost. Private rights of way and station areas might be acquired at no cost through development agreements, but all are

conservatively assumed to be purchased at full market value.

The largest right-of-way acquisition issue for all of the rail alternatives, and Option 3 in particular, is any necessary negotiation with UP. UP has suggested to ACE, however, that the entire Altamont right-of-way from Tracy into Niles Junction might be available for up to \$190 million.

BART costs in Option 4 are taken from the Phase 1 study, escalated to 2003 dollars.

The table on the following page summarizes the major cost issues for each option by segment, with the numbers broken down on page 3-12.

Operating Costs

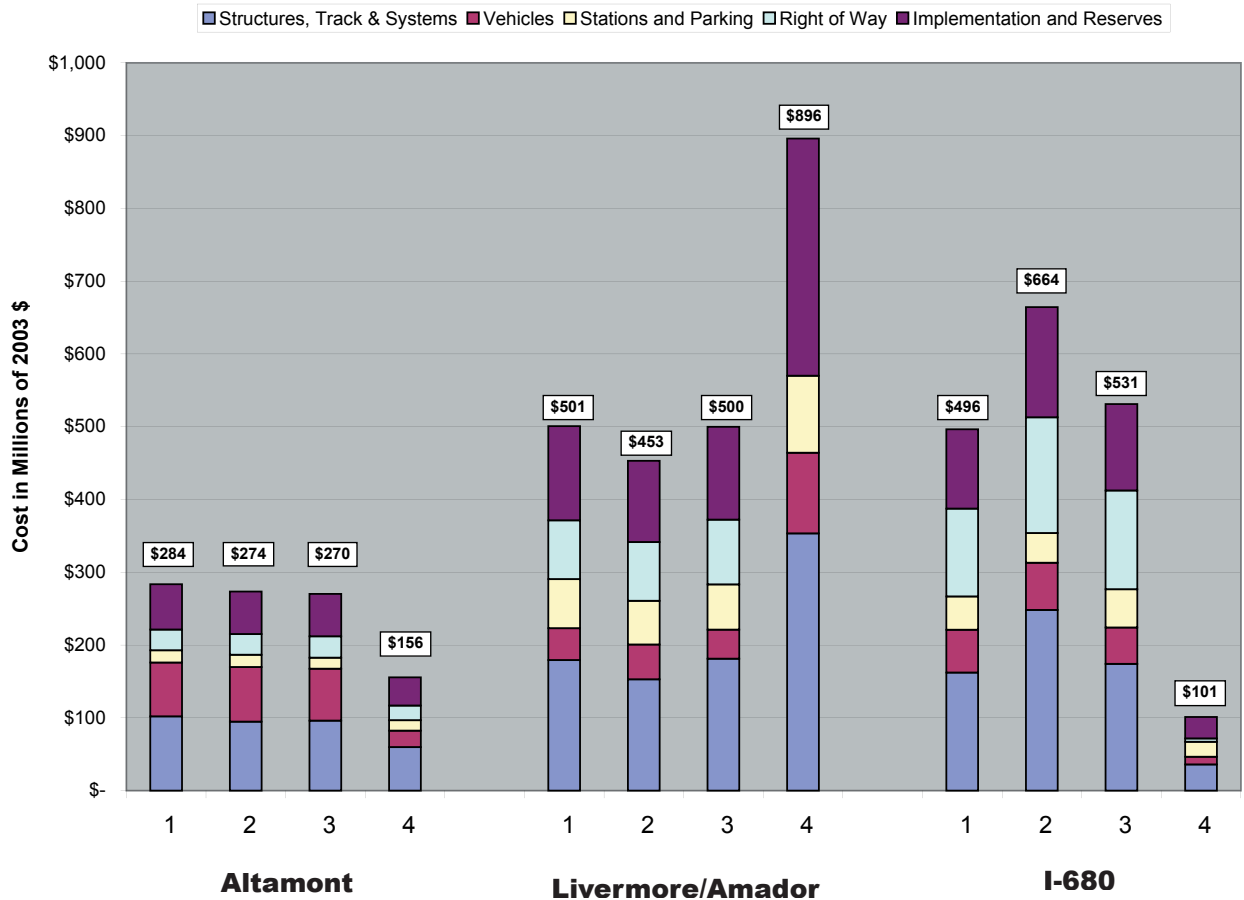
Operating and maintenance costs for the four options are similar and are detailed on page 3-13.

- As operating and maintenance costs are most directly based on the amount of service provided and the size of the fleet, the three rail alternatives have very similar O&M costs of about \$30 million per year.
- Bus operations and maintenance costs are considerably less than rail, due to the lack of trackway to maintain, and the ability to simply expand LAVTA's existing maintenance facility. (According to LAVTA staff, their existing maintenance facility can be expanded to accommodate the proposed BRT vehicles.) However, the additional costs to operate and maintain the BART extension to Greenville road result in significant extra expenses.
- BART operating costs are significantly higher than DMU options because of the additional costs of staffing and maintaining BART stations, and the higher maintenance cost of 10-car trains and BART's centrally controlled system.

Figure 3-7 Major Capital Cost Issues (*costs in millions of 2003 \$*)

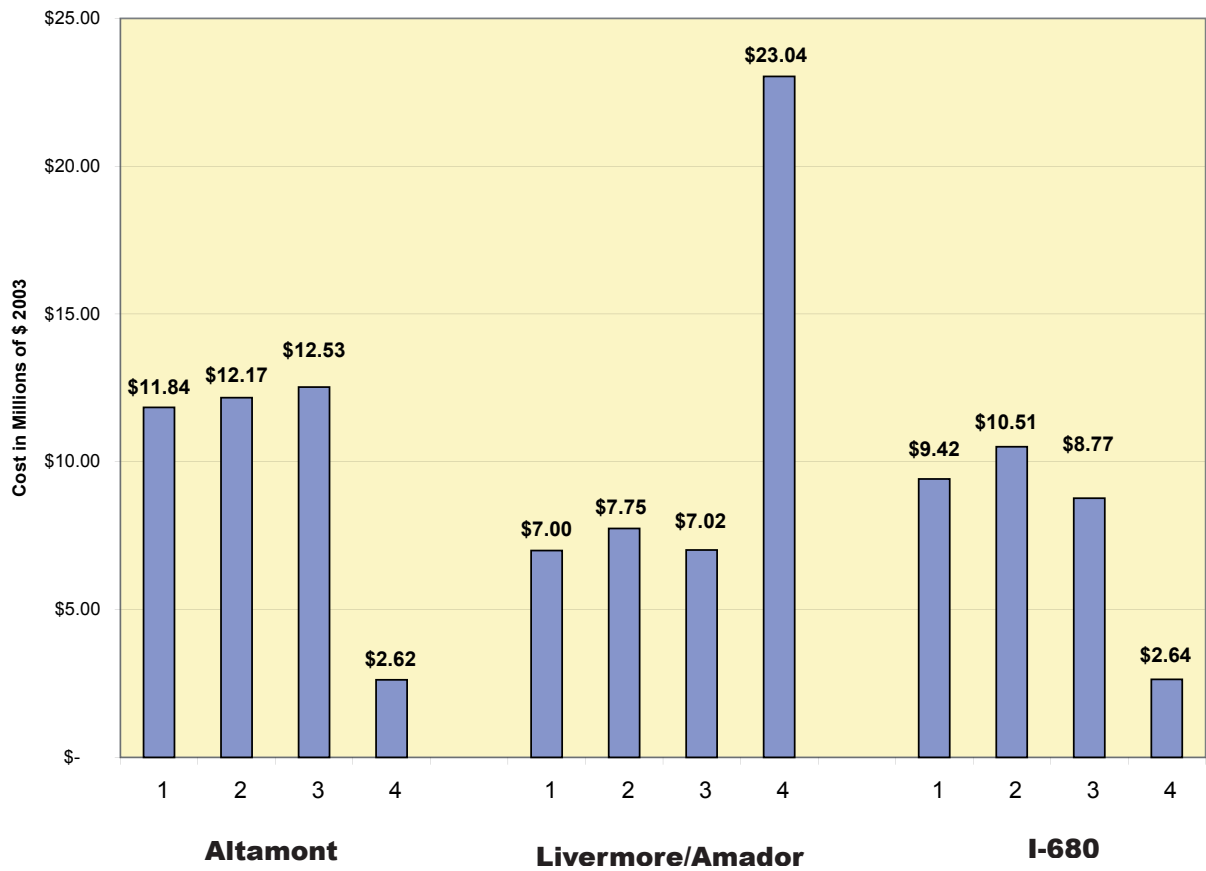
	Option 1	Option 2	Option 3	Option 4
Tracy to Greenville	Because it requires all new track its entire length and a complicated “meet” in hilly terrain, slightly more expensive than other options. \$284	Requires all new track the entire length. \$274	Requires new track on the SP right-of-way and double tracking a portion of the UP in Tracy. \$270	Widening Altamont Pass Road and Grant Line is slightly less expensive than the rail alternatives. \$156
Greenville to Dublin/Pleasanton	Tunnel in Pleasanton adds \$45 million to total cost. \$501	Without tunnels or major structures, least expensive option. \$453	Extragrade separations make this option cost similar to Option 1. \$500	Median BART extension twice the cost of the other options. \$896
Dublin/Pleasanton to Walnut Creek	Direct route via Iron Horse Trail significantly reduces costs over other rail alternatives. \$496	Circuitous routing through Dougherty Valley and tunnel to Bishop Ranch make this the most costly by far. \$664	Extra grade separations add cost to this heavy DMU service. \$531	Utilizing existing HOV lanes, this segment is about a quarter the cost of the other alternatives. \$101
Total	This is the least expensive rail alternative, due largely to its direct routing and fewer grade separations. \$1,281	Due to circuitous route, 9% more expensive than Option 1. \$1,391	About the same as Option 1. \$1,301	Low cost of BRT + high cost of BART = 10% less than Option 1. \$1,152

Figure 3-8
Capital Cost Summary (2003 \$)



Total By Option (in billions)	
Option 1	\$1.3
Option 2	\$1.4
Option 3	\$1.3
Option 4	\$1.2

Figure 3-9
Annual Operating and Maintenance Costs



Total By Option (in millions)	
Option 1	\$28
Option 2	\$30
Option 3	\$28
Option 4	\$28

Conclusions

All three DMU options are remarkably similar in both cost — varying by no more than 10% from each other. Each attracts significant riders from all four key travel demand markets. Option 1 produces the highest riders at the lowest cost, largely because it uses the most direct route through the densest concentrations of jobs and residents — the Iron Horse Trail corridor. Option 2 has about 12% fewer riders than Option 1, and a 9% higher cost, largely due to its circuitous routing through the Dougherty Valley. Option 3 has an equivalent capital cost to Option 1, but it also has the lowest ridership among the DMU alternatives, largely due to its fewer stations in key places such as downtown Walnut Creek.

Option 4 is unusual in that its BRT segments have between 20% and 50% of the capital costs of comparable DMU segments, while its median BART component has nearly twice the cost of the equivalent DMU service. The BRT ridership is equivalent to the DMU options over the Altamont, and up to 30% less along I-680. BART ridership is almost 60% less than DMU. Similarly, Option 4's BART service costs three times as much to operate and maintain as the comparable DMU services, while the BRT component costs about a quarter as much to operate as DMU.